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ABSTRACT

This report examines the composing processes of expert writers to determine which cognitive processes in expository writing produce an opportunity for a creative response. The first section considers how the ill-defined nature of many writing problems and the cognitive processes experts use to solve these problems interact to provide an opportunity for creative thinking. The second section examines how differences in writers' representation of their task can affect the originality and overall quality of their final products. The final two sections explore how writers' planning and revision processes can provide opportunities for working creatively in expository genres. The paper also reports on two case studies which compare novices to experts to examine how writers build an integrated problem representation and use diagnosis to develop solution strategies. Three figures are included, and 26 references are attached. (KEH)

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Center for the Study of Writing

Technical Report No. 32

FOUNDATIONS FOR CREATIVITY IN THE WRITING PROCESS: RHETORICAL REPRESENTATIONS OF ILL-DEFINED PROBLEMS

L.J. Carey and L. Flower

June, 1989

University of California, Berkeley
Carnegie Mellon University

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University of California
Berkeley, CA 94720

Carnegie Mellon University
Pittsburgh, PA 15213

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Foundations for Creativity in the Writing Process: Rhetorical Representations of Ill-Defined Problems

By

Linda J. Carey and Linda Flower
Carnegie Mellon

INTRODUCTION: AN APPROACH TO STUDYING CREATIVITY IN WRITING

A creative act is usually defined as one which has a valuable or interesting product and which is in some way original or surprising (Hayes, 1981). However, whether we characterize a particular act as "creative" clearly depends on the context or circumstances in which it takes place. For example, we evaluate the creativity of a child's drawing using different criteria from those we would apply to a painting by Monet; a creative act may be enriching to one individual or it may have earth-shaking consequences. While creativity in writing is popularly associated with literary genres, other genres, such as expository writing, also offer opportunities for creative products. For example, a research report, a proposal or a magazine article could be judged creative if it presents information in a new and valuable way to meet the needs and constraints of its audience and purpose--that is, if the text presents an innovative solution to a significant rhetorical problem.

In this situational view of creativity, it becomes important to ask not just how did the "genius" class of writers produce traditionally acknowledged (i.e., literary) works, but how do people in that larger class of "effective" writers produce a creative response to a given rhetorical problem? Creative responses to the rhetorical problems raised by school, professions, and public-life are necessary on a regular basis for these groups to sustain what others see as quality work. This source of practical creativity, in the face of significant but not infrequent rhetorical problems, is an asset for society that schools, professions and public groups have to depend upon.

Against this backdrop of practical creativity which a wide range of expository writers demonstrate on a variety of rhetorical problems, we want to look at the individual writer at work and to ask: what are the cognitive processes in expository writing that produce, or at least create an opportunity for a creative response?

The cognitive research we will discuss does not try to predict or even account for creativity *per se*, which, we would argue, has multiple sources. Furthermore, the studies we review were not explicitly designed to measure creativity itself but rather to analyze features of expertise. What this research does show us is how certain features of the writing process itself (namely, working with ill-defined problems, task representation, integrating topic and rhetorical knowledge, and strategies for global revision) provide a cognitive mechanism that has the potential to produce a uniquely adaptive response. These features operate as an opportunity or an invitation for creativity--an invitation that writers often decline.

In this chapter, we examine the composing processes of expert writers working in expository genres. We take a problem-solving perspective (see Newell & Simon, 1972; Simon, 1986) which postulates that creativity does not depend on

"special" abilities or on unconscious processes and insights, but rather on ordinary cognitive processes which are applied in powerful ways. We draw on research into writers' composing processes, and particularly into their planning and revision processes (Flower, Schriver, Carey, Haas, & Hayes, 1987; Hayes, Flower, Schriver, Stratman, & Carey, 1987), which indicates that when expert writers tackle academic or professional expository tasks, they engage in active and complex problem-solving in order to define their task and solve their rhetorical problems in unique and interesting ways.

In the Section I, we discuss how the ill-defined nature of many writing problems, and the cognitive processes experts use to solve these problems interact to provide an opportunity for creative thinking; in Section II, we examine how differences in writers' representation of their task can affect the originality and overall quality of their final products; and in Sections III and IV, we look at how writers' planning and revision processes can provide opportunities for working creatively in expository genres.

SECTION 1: CREATIVITY AND ILL-DEFINED PROBLEMS

How do expository writing tasks provide opportunities for creativity? To address this question, we will follow the lead of Newell, Shaw and Simon (1964) who propose that a creative act is the act of solving an ill-defined problem. These are problems where solvers have to define the problem for themselves and where they have to "fill in the gaps" of the problem with specialist knowledge; each problem-solver's solution will be unique because it reflects the solver's own unique knowledge and values (Hayes, 1981). Thus the very nature of an ill-defined problem stimulates creativity in the problem-solver. Many problems in architecture, in design and in music would certainly fall under this umbrella of an ill-defined problem (see Simon, 1973; Reitman, 1964) and these are, of course, areas where we would expect to find expressions of creativity. Similarly, many writing tasks also present a solver with an ill-defined problem and hence with a potential for creativity.

While all writing tasks are ill-defined in comparison with, for example, game problems (such as the Tower of Hanoi problems discussed by Newell & Simon, 1972), some tasks are more ill-defined than others. Tasks such as a routine rejection letter or a lab report for a physics class, for example, may require little active problem solving *if* the writer has already written several of these before and hence is very familiar with the discourse conventions. The writer can simply "fill in the blanks" in his or her standard outline (or "script") for the task with appropriate content. Other tasks may only require writers to access their knowledge about a particular topic and to reproduce it on paper. (Reporting the minutes of a meeting would be one obvious example.) Here we will discuss those expository tasks which do require active problem-solving. How do good writers develop creative solutions to complex, ill-defined writing tasks and why are student writers' texts often disappointingly routine?

We will address these questions by looking at three processes which our research suggests are crucial to dealing with ill-defined writing tasks:

1. constructing an elaborated and flexible representation of the task;
2. integrating topic knowledge and rhetorical knowledge; and
3. applying and controlling problem-solving strategies.

Constructing a Representation of the Task

Ill-defined problems, by their very nature, do not present solvers with a ready-made task representation. Rather, in response to vague task specifications--such as "build a house" or "write a research proposal"--a problem-solver has to take an active role in defining the boundaries of the problem and in specifying a set of goals and criteria for the task. Thus, when faced with an unfamiliar writing task, a writer has to *construct* his or her own unique representation of the rhetorical problem to be solved (Flower et al., 1987). Although a topic may be assigned (as in many college writing tasks), or the format may be pre-specified (there are standard guidelines for writing a proposal), the conceptual structure the writer creates around a topic, and the function to which those format features are put, reflect the private goals of the writer.

For instance, expert writers spend considerable time and attention elaborating a network of goals, constraints, and criteria as they compose (Flower et al., 1987). They may draw inferences about the audience and set goals for dealing with it, or they may translate format features, such as an obligatory introduction, into goals. These goals, of course, could reflect a conventional plan (e.g., "better start out with a topic sentence and some background) or a uniquely adaptive one (e.g., "how about showing them in some subtle way, what they appear to assume"). Setting goals does not guarantee unique goals, but the planning process we have observed in expert writers goes well beyond a simple selection and transcription of topic knowledge. Even on a "normal" academic task, such as that faced by the contributors to this volume, there is likely to be enormous variety in the way the task "write about creativity in XXXX" is framed and in the top-level goals and constraints writers give themselves. These goals, created in interaction with the writer's topic knowledge, then determine how much of that knowledge is used and how and why it is used.

Because complex writing tasks are quite literally *constructed* by the writers, people with the same assignments give themselves significantly different rhetorical problems. The nature of these ill-defined problems--which writers structure and define for themselves--then, is an important basis for creativity in writing. Some writers exploit this potential by giving themselves unique and valued problems to solve. In a study of writers' initial task representations (Carey, Flower, Hayes, Schriver, & Haas, 1986), we found that the nature of the goals that a writer develops in his or her task representation may well affect the quality of the final product and provide an opportunity for creative problem-solving. In Section III, we will discuss how qualitative differences in writers' initial task representations are mirrored by differences in the quality of their final texts.

Building a representation of an ill-defined problem is also a dynamic process (Simon, 1973). Expert writers' representations often change as they progress through the task: new facets of the problem may occur to experts during writing which change their goals and require them to re-represent the problem or to modify a current representation (Hayes et al., 1987). For example, in writing a proposal a writer may realize, on reading the introduction, that the purpose of the research may be clear, but not persuasive. The writer may then have to develop a set of unique goals and sub-goals for persuading the reader that this particular project is needed and feasible. This process of constructing and reconstructing an image of the task in response to the growing text often leads writers to the *discovery* of some unique and valuable insights about their task (Flower & Hayes, 1980) and hence provides opportunities for creative thinking.

This phenomenon of building a *dynamic* task representation seems to be important to creativity in domains other than writing. For example, a study by Getzels and Csikszentmihalyi (1976) found that artists whose work was rated high for creativity often discovered new dimensions to a problem as they worked on it; these creative artists were modifying their problem representation in response to their emerging drawings. Or as Perkins (1981) points out, creative problem-solvers remain ready to change their decisions in the light of new knowledge gained from working on the problem and thus remain open to new insights.

The process of constructing and modifying a representation of the task presents inexperienced writers with several difficulties which limit their opportunities for creativity. First, novices may simply "jump into" the problem without spending time and effort on re-representing and discovery. The result may be that they are then forced to work with an initial representation which is too abstract or which does not address important features of the task. Certainly, in our work on planning, we found that novice writers tended not to build the complex networks of goals and sub-goals which typified the plans of the expert writers (Flower et al., 1987) and, as a consequence, their texts failed to address important audience needs.

Second, novices may become committed to one representation of their task and not be open to re-representing the task in light of new discoveries. For example, Beach and Eaton (1984) found that many of their student writers typically relied on the "five paragraph theme" pattern of organization and were unable to adapt their texts to the constraints of audience and purpose; similarly, Britton, Burgess, Martin, McLeod and Rosen (1975) found that students' representations of rhetorical problems were fixed by their perceptions of the demands of the teacher and school context, rather than by their sense of audience and purpose. As a result, their texts tended to be formulaic and to lack interesting or novel perspectives.

Integrating Topic Knowledge and Rhetorical Knowledge

Another opening for creativity in writing is the way in which people manage the constraints of integrating their topic knowledge and rhetorical knowledge. Simply put, writers must often manipulate or transform what they know to meet the constraints of a unique rhetorical situation (Scardamalia & Bereiter, 1987). If the subject is complex or new, writers will not have available pre-packaged or organized pieces of information which can simply be slotted into the text. Rather, they will have to engage in difficult knowledge transforming operations to adapt what they know to meet the rhetorical goals of, for example, involving and interesting a particular audience (Scardamalia & Bereiter, 1987). This "juggling act" between two different knowledge domains, content knowledge (i.e., about the substance of the text) and rhetorical knowledge (i.e., about the constraints of audience, genre, purpose, etc.), presents an opportunity for expert writers to re-structure their knowledge in insightful ways and thus provides a potential for creative expression.

However, this juggling act appears to present difficulties for developing writers. As Scardamalia and Bereiter's study indicates, inexperienced writers often take a "knowledge telling" approach to expository writing; they simply write all they know about a topic without considering rhetorical features such as audience and purpose. Similarly, Langer (1984) found that having a lot of information on a topic did not necessarily help students to write coherently on that topic; they were unable to structure their knowledge into an appropriate rhetorical pattern to develop,

for example, a cause/effect essay. In our studies of planning, we found that writers whose plans mainly consisted of "content plans" produced texts which were less well adapted for audience and purpose than writers who integrated content and rhetorical planning (Carey et al., 1986).

Adults who are capable of adapting what they know to what a reader needs or wants often fail to do so--they report information when the reader needs a recommendation; they define technical concepts when the learner/textbook-reader needs an orientation to the field. In this "writer-based prose," writers take the cognitively less demanding route of talking to themselves (Flower, 1979). Sometimes this is an efficient first draft strategy and the writer can transform the text into "reader-based prose" later. The interaction of rhetorical and content knowledge, then, is both a problem which some writers don't solve and a constraint which generates uniquely adaptive solutions for other writers.

Developing and Applying Problem-Solving Strategies

As we have seen, ill-defined problems require a solver to manage both an evolving set of goals and constraints and a large body of knowledge. To accomplish this management task successfully, a problem-solver needs to use strategies for cutting down the search process (Simon, 1973). Our research indicates that expert writers have a wider repertoire of such strategies than do inexperienced writers. For example, we found that our expert planners had several strategies for resolving goal conflicts and for consolidating information; our novices, on the other hand, often simply side-stepped these problems and, as a result, missed opportunities for developing promising aspects of the text (Flower et al., 1987). Similarly, expert revisers seem better equipped to deal with difficult global revision problems because their strategies are more efficient and more flexible; in contrast, novices frequently rely on a time-consuming and risky trial and error procedure of re-writing the text until it "sounds better" (Hayes et al., 1986). (We will discuss this work on revision in more detail in Section IV.)

Strategies, like some of the other features we have discussed, seem to operate as alternatively a path or a roadblock to creativity. Rose's study, *Writer's Block: The Cognitive Dimension* (1984), documents some of the ways in which the possibility for creativity is shut down by the rigid rules and strategies which students bring to writing. Student writers who regularly blocked or failed to do assignments voiced absolutist assumptions about how the writing process should operate (e.g., as a spontaneous and elevated act, in which formal pre-planning is inappropriate), whereas non-blockers recognized a variety of acceptable approaches determined by the context. The high-blocking students also invoked a variety of rigid rules to which a writer must adhere (although they did not agree on the "rules"). Some of these rules demanded concentration on the surface features of text, rather than on the conceptual structure, for instance, and led to a premature editing. As one student put it, "I write with the thought . . . that this is going to be it . . . so it had better be good the first time through" (p. 73). Finally, some of the limited strategies that Rose's students brought to writing, such as depending on the five paragraph theme, allowed only limited structures of thought. And they led to "incremental" planning in which students planned and composed in small, unconnected segments.

The strategies, assumptions and rigid rules of the high-blockers seemed, then, to interfere with their day-to-day functioning as writers in the university. What is interesting for our purpose is that this maladaptive approach to writing

seems to operate by shutting down the processes that can foster creativity--the processes of integrating and re-integrating information and of taking a flexible, context-dependent approach to managing strategies. For high-blockers, the constraints that lead creative writers to unique, adaptive plans have ceased to be generative

Having a repertoire of strategies may not be sufficient to ensure success in solving ill-defined writing problems; a writer must also know *when* to use a particular strategy and be able to monitor and test its effectiveness. This *metacognitive* ability--that is, the ability to regulate one's own strategic action (see Brown, 1982)--allows writers to have more control over their own processes. In our revision research, (Hayes et al., 1987), we found that expert revisers made conscious decisions about which strategies to use, based on criteria such as the nature and density of the problems in the text and the pragmatic constraints of the task (e.g., the amount of time available. The novice writers in our study, however, often failed to deal adequately with text problems because they were inflexible and kept with one strategy, even if it was obviously not working for them. Similarly, research on reading, summarizing and learning (Brown & Smiley, 1978; Brown, Day, & Jones, 1983), suggests that novices' lack of conscious regulation restricts their ability to use effective comprehension strategies such as re-reading, making inferences and extracting gists, even if they are aware of these strategies.

To sum up, from the perspective we are taking, many writing tasks are best described as ill-defined problems in which writers construct their own network of goals and plans. The initial representation a writer creates can, of course, be simple and/or conventional, but it can also be an elaborated and unique construction. Hence the process of writing itself opens the door for creative cognitive acts. Secondly, the recursive nature of the writing process observed in studies of planning and revision allows, and in fact calls for, re-representation. As writers generate information through the activity of composing itself, they also perceive new goals and constraints and their image of the task itself is frequently open to transformation. The process opens a door, but whether or not writers do indeed integrate this growing network of goals and topic knowledge into a coherent, much less unique configuration is a question we will look at in the context of specific parts of the writing process.

In tune with our focus on practical creativity, we are looking at the way the "normal" processes of composing can lead to creative results. We are assuming, as has Simon, that creative acts do not depend on "special" or extraordinary basic processes. In the research we are about to describe, we cannot assert that the written products of the subjects studied would be judged as creative, since public judgment of uniqueness plus value is our standard. The research did not set itself up to study creativity *per se*, but expert and novice performance. So the conclusions one can draw are necessarily limited. What we do propose to do is to look more closely at how writers tackle these difficult processes of building a representation of a writing task, integrating topic and rhetorical knowledge, and developing and applying problem-solving strategies. We examine these processes in the context of three different kinds of professional and college writing assignments: a task which required interpretation and synthesis of reading materials, one which involved planning and writing a short expository text, and one which was essentially a revision task.

The processes we have chosen have three qualities: they are generative *and* integrative processes and they have the potential to affect the top levels of a writer's goal structure. These processes do not, in themselves, produce a creative response

to a rhetorical problem, but they do provide, we will argue, the operational foundation for responses that are both novel and highly adaptive to the context for writing. From an educational point of view, these seem to be aspects of the writing process that writers learn to manage with some difficulty, that lead to effective writing, and that have the potential to lead to that special effect we label creative.

SECTION II: THE EFFECT OF TASK REPRESENTATION ON ORIGINALITY

The practical creativity on which we concentrate in this paper requires an original, but highly adaptive response to a rhetorical situation. A creative solution has to function within a considerable set of constraints set by the context. For instance, writing in these situations is often in response to an assignment posed by an organization, by a manager, or by a teacher. Britton et al.'s study (1975) of 2000 samples of school writing in Great Britain, grades 6-12, suggests that school assignments may severely limit opportunities for both originality and imaginative adaptation. By grade 12, 61% of the scripts studied were categorized as papers written by "pupil to examiner," "as a demonstration of material mastered or as evidence of ability to take up a certain kind of style" (p. 122). In Britton et al.'s report, the terms "assigned" or "school" writing are sometimes used as synonyms for non-creative and purposeless exposition. Sadly enough this may be an apt description for how some teachers use writing (as a test for content knowledge or correctness) and how their students learn to see assigned writing. However, a look at the writing processes of college students suggests that assigned writing is, like any other constraint, subject to interpretation. The task the writer gives him or herself may be a much better predictor of creativity than whether it is assigned and/or highly constrained.

As a case in point, we can take a close look at the task representation process itself, as it occurred in a large group of college students writing a paper on an assigned body of readings.

Alternative Representations of a Standard College Task

> In this study, four sections of a freshman class (N = 72) were given a standard, open-ended college assignment which read:
>
> Here are some notes, including research results and observations, on time management. Your task is to read and interpret this data in order to make a brief (1-2 page), comprehensive statement about this subject. Your statement should interpret and synthesize all of the relevant findings in the text.

The text was two pages of notes and conflicting claims taken from various "authorities" on the topic of time management, ranging from Alan Lakein on how to "take control of your time and your life," to advice from Cornell's study skills center, to William James' comments on working through fatigue. The assignment was designed to include all the sacred words of college assignments: synthesize, interpret, be comprehensive, and the essay was referred to at the end of the readings as "your statement." The intent was to create a Rorschach assignment which would let students examine their own process and interpretation of this college assignment. On the day the assignment was due, students did a self-analysis of how they had viewed the task in terms of the information source they used, the format they thought appropriate, their overall organizing plan, and some of their dominant strategies and goals. These categories and a checklist students used were based on

three prior pilot studies which had shown us a wide range of response to two parallel versions of this assignment. Certain features of these self-analyses are relevant to creativity.

For this assignment, 43% of the freshmen students organized their paper as either a summary of the source texts or as a review and comment--a plan in which the source texts provide a conceptual frame and substance, to which the writer can add a commentary at selected spots (Ackerman, in press). Only 25% of the students attempted a synthesis in which their essay was organized around a controlling concept which gave structure and coherence to their discussion. Students who gave themselves the task of synthesis had to invent a concept that could make sense of this data, even though, like normal library research, the information did not fall into a simple or obvious pattern. And they had, at least in theory, to deal with the contradictory claims of these "authorities." An even smaller group, 11%, said that they treated the paper as an interpretation of the source texts, organized around a purpose of their own. To use this plan, writers had to imagine a reader who would find the information useful or to see an issue or problem to be examined and use that purpose to organize an interpretation of the relevant material. This plan typically makes heavy use of the writer's own ideas.

When asked to describe their own strategies, 2% of the freshmen said that they used the strategy of "adapting to the reader"; 6% chose to "use the text for my own purpose." However, when they were later asked to predict what a group of more experienced, masters level students had done on this task, the predicted use of these adaptive strategies jumped to 24% and 15%. The freshmen apparently saw these strategies as options at least for someone. Some freshmen who commented on this difference, attributed it to the greater freedom they perceive master's students to have.

Finally, the checklist, though naturally incomplete, also listed a number of goals previous writers had mentioned. The freshmen students identified their goals with choices such as "presenting learning" (20%), "covering key points" (18%). and "do the minimum" (13%). Zero per cent checked the goal of "creativity." Taken together, these analyses show some students giving themselves tasks in which a creative response is unlikely to occur. These data come from the students' own self-analyses; the data based on judges' analyses of the texts showed even lower frequency of syntheses and interpretations. However, these self reports are interesting because there were clear cases in which students attempted more ambitious tasks, even though the judges were unable to perceive the result of that effort in the written text. The thinking-aloud protocols and the in-class presentations of three of these students can give us a more explicit view of how these interpretations were created (Flower, in press). (The data for this discussion come from a classroom study with advanced students.)

Martha was a junior engineering major. Students in her class had done a thinking-aloud protocol of themselves as they read the source texts and wrote their essays. The protocols let them look closely at their own cognition and prepare an in-class presentation on an "interesting feature" of their own writing process. Martha's presentation focused on her own very clear procedure for doing the task. She used what the class came to call the "gist and list" strategy: you read through the text with some care, find the key words in each paragraph, and summarize it trying to capture the main idea. You then write a paper organized around this set of gists. The most interesting feature of her plan was its caution rule: sometimes a new idea will occur to you as you are writing--a new connection, an insight or new way to organize. If that happens, you must decisively ignore this possibility for it will

only confuse you and your paper. Martha's representation of the task placed priority on accurate summarization, efficiency, coherence. Furthermore, this was a practiced strategy for her, "just like doing a research paper." The task Martha gave herself seemed very close to the limited "pupil to examiner" recitation of knowledge Britton's group observed and deplored.

In contrast to Martha, Kate, a beginning graduate student in professional writing also in the class, focused on the way the audience determined the focus of the paper and defined what information was "relevant." The task she gave herself required adapting her reading to what she imagined her potential readers would be interested in. The protocol also shows us how introducing this additional constraint of audience solved the problem of generating enough to say:

> Hmm. Let's see. Ok. I don't see how I'm going to get 1-2 pages out of studies and experts that pretty much back each other up. Damn. I wish I'd never sold my acoustics textbook [reference to an interruption by a roommate.] Well, who are my readers? About 15 people who mostly teach the freshmen course . . . Yes, so why would anyone care to hear about this? . . . So they want to know how to write better, but maybe more importantly how to teach better. Oh yes, and Linda Flower, but there's no doubt she's interested in that to. Ok. They're my primary audience, so. . . .

As a result of these goals, Kate generates ideas not found in the source and begins her text by telling readers two ways in which her information might be of use to them. This view of writing as an adaptive enterprise is apparently not new to Kate. In her own presentation and in response to Martha's very different plan, Kate remarks that as a past economics major, she even has a private formula for her procedure: T = f(A). The topic or information she uses is a function of the audience.

Both Kate and Martha appeared to bring well-learned plans for interpreting writing tasks with them. And in one of the pilots, 50% of the students said that they paid no attention to the assignment itself, but invoked their standard paper writing strategies. In light of the clear variety among these these representations, one wonders how often the "standard" strategy is the optimal one for all of these writers. Our final example, shows a student actually negotiating a decision point in her task representation and considering the costs and benefits of alternative interpretations.

> "Interpret and synthesize" [student is rereading the assignment].
> What the hell does that mean? Synthesize means to pull together, no, to make something up. Why should I want to make something up?
> [She then rereads, commenting on the wording of the assignment. . . .]
> Synthesis sounds like I'm making a chemical compound. Humm. Put together.
> [Re-reads] "All of the relevant findings in the text."
> How can I do this?

At this point the writer apparently decides that she does not in fact want "to make something up" and begins to summarize the readings.

It is not surprising that different representations of a writing task could have the effect of fostering or discouraging original thinking and an adaptive response to the needs of readers. The striking feature of these protocols and presentations is that the students who held these different representations appeared to assume that they were simply doing the task as it was assigned, rather than constructing an interpretation, and were surprised to discover the range of options others considered possible--if not actually mandated by the assignment. Students who were limiting the likelihood of creativity may have done so in the name of least effort, but they appeared to do so in the faith that that was also expected.

Of course, it does not follow that even students who set the goals of being creative will be able to be so. One student in the pilot class said that she habitually set high standards for creativity in her own writing. However, as the protocols made clear, this goal actually functioned as a test which she applied during composing to fledgling ideas and initial bits of prose--which generally failed to pass the test of this rather harsh and premature internal critic. Setting the goal did not seem to promote creativity itself.

In summary, on a reasonably complex task, such as these college assignments, task representation becomes a critical part of the process. The goals and constraints students invoke may have sources in unquestioned past experience, or in active, inferential efforts at representing features of the task; however, the qualitative differences in these representations point to their constructed nature. Some of these representations shut down the possibility of creativity by giving low priority to the writer's own ideas, by specifying a linear composing process undeflected by those discoveries writing itself engenders, and by eliminating the need for an adaptive transformation of knowledge and treating writing as knowledge-rehearsal rather than as a potentially useful, rhetorical act. Because task representation in writing is a) a highly interpretive process, but b) often unrecognized and hence closed to critical examination, it appears to play an important role in opening the door for creativity in some cases and closing it in others. In the next case in point, we will look more closely at the content of the initial task representations of a group of expert and novice writers.

SECTION III: INTEGRATING TOPIC AND RHETORICAL KNOWLEDGE IN INITIAL PLANNING

A writer's task representation can, as we have seen, open up possibilities for originality, or confine a writer to producing a routine, standard text. To develop an effective representation of an ill-defined task, writers need to adapt their knowledge about the topic to meet the constraints of audience and purpose. This integration of content and rhetorical knowledge can provide unique opportunities for experienced writers, while for others it can be prohibitively difficult. In this section we will take a closer look at the *process* of building a task representation of a typical ill-defined professional writing task. What qualitative differences do we see between experts' and novices' task representations which might help account for experts' practical creativity and students' "run of the mill" responses to many academic or professional writing tasks?

In the study we will discuss here, (Flower et al., 1987) five experienced composition teachers and seven student writers with varying degrees of skill were given an expository assignment in which they were asked to write a short article describing their job for *Seventeen* magazine--that is for an audience of girls aged about thirteen or fourteen. The task was ill-defined in that each writer could draw

on and adapt a unique body of personal knowledge about her job and develop a unique set of goals to reach the young readers of the article. Clearly, there was a great variety of ways of approaching this task and hence a potential for interesting, adaptive solutions to a complex rhetorical problem. Our writers on this task had to do what many professionals writing to lay audiences have to do: a) determine their own goals, including representing the audience to themselves and deciding how to meet the audience's needs; and b) decide what knowledge was relevant, given their goals. For many writers, even the question of defining their job was open to debate. Their answer depended, in part, on their image of the audience and the goals they set for this essay. And that decision, in turn, appeared to depend partly on what information would be easy to access.

We looked at our writers' initial plans, taken from verbal protocols of our subjects working on our task. (By initial plans, we mean plans articulated before writing a first sentence; see Carey et al., 1986). We found that while all our writers developed initial plans for *content* (i.e., for what information they should include), our most successful writers also developed quite complex *rhetorical* plans for their text (e.g. plans related to audience, to overall purpose or organizational structure). Although our writers' specific rhetorical goals and plans for the task were diverse--some were personal or even idiosyncratic, e.g., "I must change their mind about what an English teacher does"--we found that our writers' rhetorical plans included information in the following four major categories:

- *Overall purpose or "theme"*: This encompassed goals and plans for what the essay should accomplish, for an overall focus or for a unifying idea around which other ideas could be developed. For example, one writing teacher came up with a top-level goal to focus on "how a teacher differs from a professor"; another, on using this essay to "raise (students') horizons and help them to examine their own future."

- *Audience*: These were plans which developed a representation of the audience for the text. For example, one writer represented her audience as "people like myself, or people like I was, but adjusted for twenty years"; another subject considered their current interests "they're all in school, they're taking English, for many of them English will be a favorite subject." Many of our experienced writers, in fact, actively struggled with alternative views of their readers.

- *Structure*: Here writers developed goals and plans for organizing or structuring the text. For example, one of our writing teachers came up with a structure which mirrored the important aspects of his job as a writing teacher, "What about a sequence . . . (a writing teacher) reads papers, makes up assignments . . . I want to start with what they think is obvious."

- *Other rhetorical goals*: In this category we found diverse plans for addressing this particular audience, for projecting the writer's persona, for the language and tone of the text. For example, given the needs of his readers, one writer decided that "the tone and style in *Seventeen* . . . should be light and lively, filled with slang."

The writers in our study who produced the most successful and innovative texts (in general, but not exclusively, the expert writing teachers) were those who developed plans in all these categories before beginning to write. These writers

were able to build what we have termed a "*rhetorical representation*" of their task which provided an overall framework for generating and selecting information to include in the text. They integrated topic knowledge with rhetorical concerns and inter-related rhetorical goals so that, for example, they saw purpose as closely connected with audience needs. This rhetorical representation provided a unifying and coherent "theory" of the task as they defined it for themselves.

Let us take a look in more detail at how one of our most successful writers built a rhetorical representation of the *Seventeen* magazine task. This writer produced an innovative text which provided an interesting angle on his job as a college writing teacher which was particularly appropriate to the interests and needs of his readers. The excerpts, taken from a verbal protocol of this writer working on our task, include some of the subject's most important initial planning episodes and our categorization of the goals and plans he is developing.

Clause #		**Analysis**
Episode 1		
16	Job--English teacher rather than professor.	**Content**
18	In fact that might be a useful thing to focus on.	**Theme** Defines focus of text
19	. . . how a teacher differs from a professor.	
20	and I see myself as a teacher.	
21	That might help my audience to reconsider their notion of what an English teacher does.	**Theme/Goal** Sets top-level goal
23	(Reads) young female teenage audience.	
24	They will all have had English.	**Audience**
25	Audience--they're all in school.	Represents relevant
26	They're taking English.	background of readers
27	For many of them English may be a favorite subject.	
29	But for the wrong reason--some of them may have the wrong reasons in that English is good	**Audience** Represents attitudes
30	Because it's tidy.	
31	Can be a neat tidy little girl.	
32	Others turned off because it seems too prim.	
33	By God, I can change that notion for them.	**Theme/Goal**
Episode 2		
45	All right I'm an English teacher.	
47	I know they are not going to be to be disposed to hear what I'm saying.	**Audience** Represents attitudes
48	Partly for that reason and partly to put them in the right--the kind of frame of mind,	**Goal**: Prepare audience
49	I want to open with an implied question or a direct one,	**Structure**
50	and put them in the middle of some situation,	Develops skeleton structure
51	then expand from there to talk about my job more generally,	
52	and try to tie it in with their interest.	**Goal**: Involve audience
53	So one question is where to begin.	**Structure**
54	Start in the middle of--probably the first day of class.	Plans introduction
55	They'd be interested.	

56	They'd probably clue into that easily	**Audience**
57	because they would identify with the first days of school,	Represents a shared reference
58	and my first days are raucous affairs.	
59	It would immediately shake 'em up	**Goal**
60	and get them to think in a different context.	Develops audience goals

What features do we see in these excerpts which would lend support to our hypothesis that experts build a rhetorical task representation?

First, this writer's task representation is *rich in rhetorical information.* In these episodes he develops plans in all the rhetorical categories discussed above. Not only does he develop plans for specific content to include in his text, but he also develops a theme, a partial structure, a quite detailed representation of his audience and a set of task-specific goals. For example, he develops a representation of the audience which includes their background (they take English in school and may enjoy it) and their attitudes (they are not going to be disposed to hear what I'm saying). From this representation he develops a set of goals for his audience--to "shake them up" and make them think in a different context.

Second, the goals that he generates provide an *integrated rhetorical framework* for his planning. Instead of piecemeal idea generation or brainstorming, we see this writer generating and organizing content to meet his particular persuasive purpose. For example, he starts out with a scenario which will put the audience in the right frame of mind and which will help them to think about English teaching in a different context. His text plans are thus adapted to fit with his guiding focus. In addition, many of his goals interact with each other and two goals may be instantiated by a single text plan. For example, he comes up with the idea to talk about his first day of class *because* this would further his goal to shake up his audience and *because* this would be something his readers could identify with. Thus this one text plan instantiates two of his important goals.

In sum, this writer is generating a set of goals and plans which make this task uniquely his own. While the task instructions provide him with some loosely defined goals and constraints (the topic, the genre and the audience), he uses the umbrella of a rhetorical framework to adapt, elaborate and instantiate these goals. The task that he ends up doing is very much a task that he himself has created, and a task which results from a coherent theory of the task based on rhetorical principles and concepts.

What alternatives to a rhetorical representation might a writer use? We found in our study that several of our inexperienced writers focused their initial planning almost exclusively on generating ideas about what content to include and that they ignored many of the rhetorical features that we found in our experts' initial plans. Thus they engaged in a type of "knowledge-driven" planning without transforming their knowledge to meet the constraints of audience and purpose. Below are some early protocol episodes from one student writer working on our *Seventeen Magazine* task. This writer's final text was rated eighth out of twelve for quality.

Clause #		**Analysis**
Episode 1		
6	I'm going to assume here I'm an engineer.	**Content**
8	I guess a research--a research engineer.	Defines subject matter of text
10	However, there's a graduate student	**Content** (to end of Episode 1)

11	because I'm a graduate student.	Explores different aspects of job
12	So . . . really my job is I'm going to school.	
13	Let's see--I'm a graduate student,	
14	and I'm an engineer,	
15	and I'm a research engineer.	
16	So everything is there.	
17	So maybe I should explain here instead is that I'm a graduate student pursuing a Ph.D. in engineering.	
20	I do research work.	
22	I teach a course.	
Episode 2		
24	(Reads) for a thirteen to fourteen teenage audience	
25	So we have to address the fact that this girl girl is seventh or eighth grade.	**Audience**
27	Okay so these are all the things going through my head relative to engineering--research engineering	**Content** Reviews possible
28.	These are all the things I'm supposedly doing	details to include
29	and I'm pursuing a Ph.D.	
30	Working on a thesis.	
32	My job here is wrong, the way I'm interpreting my job	
34	The way I'm interpreting my job means what I'm doing with my life at this moment in time.	**Content** Re-defines topic
Episode 3		
37	The girl is approximately in seventh or eighth grade.	
38	. . . the assignment has to appeal to a broad range in intellect	**Goals** Sets very general audience goals
39	It must explain simply what I am doing.	
43	I have to generate an essay	**Structure**
44	We'll assume it's about two pages.	Specifies genre and length
48	That's not really hard.	
49	I really have my first line	**Process comments**
50	so I'm going to rip off the page here.	
52	I think I can write this out very quickly.	

This student's task representation looks different from the expert's in several ways. First the subject generates *few rhetorical goals* in contrast to the expert's rich rhetorical planning. Rather, most of the planning is related to features of the topic--e.g., the main aspects of his job as a graduate student in engineering and whether being a researcher is in fact his job. He includes no goals for an overall theme or focus to the text; little information about organization beyond a very general sense of the genre and the length; almost no information on his audience's interests or characteristics, beyond that provided in the task instructions; and no goals for the text beyond a rather vague sense that he should "appeal to a broad range in intellect" and "keep the text simple". The very general rhetorical goals that he does come up with (e.g., address the fact that this girl is in the seventh or eighth grade) are not further instantiated with sub-goals and text plans and he is unable build upon them.

Second, we do not see the integrated overall framework to guide his planning process. His planning does not seem to be organized by rhetorical features but rather *generated haphazardly* by features of the content with which he is struggling. Thus, unable to transform his content to meet the constraints of the assignment and unable to build his own unique set of rhetorical goals for his task,

this writer has little option but to "knowledge tell." His text reflects this limitation as he produces a rather dry description of energy research, which our raters judged to be low in meeting the needs of the audience.

In sum, without any unifying theory of his task, this writer has little choice other than to plunge in and write, letting his topic information drive his planning and generating process. Although he does plan more extensively than many of our other subjects, his plans do not help him to carve out a very appropriate and effective representation of his task.

The two writers we have looked at in detail here were in many ways typical of our writers in this study. Several of our subjects built quite complex rhetorical representations of the task, analogous to the one in our first case-study, whereas others focused almost exclusively on content plans, as did the writer in the second case. Overall, we found that those writers who engaged in rhetorical planning before writing produced texts which were more successful (particularly in terms of meeting the needs of the audience and in developing an effective rhetorical purpose) than those who did not. In fact, our writers whose plans were judged to be rich in rhetorical information were judged *independently* to have the best texts (see Carey, et al., 1986). (There was a high positive correlation ($r = .874$) between the quality of initial planning--in terms of the rhetorical features discussed earlier--and text quality.) In addition, we found that:

1. Writers who developed plans in *all* the rhetorical categories of audience, purpose, theme and other rhetorical features, as well as content plans, received significantly higher scores for their final text ($p = .0149$, by the Mann-Whitney test) than writers whose planning failed to recognize one or more of these categories; only *one* of the writers whose text received a score in the lower half of the distribution of scores covered all these categories in his initial plans. In addition, those writers whose plans included goals for an overall focus or "theme" for the text received significantly higher scores than those who did not ($p = .0185$). Our weaker writers demonstrated a lack of concern for rhetorical features either because they did not have the appropriate rhetorical knowledge, or because they did not realize the importance of rhetorical planning.

2. Conversely, the writers who produced the more successful texts had a *lower* percentage of content plans than did writers who produced the poorer texts. (We found a *negative correlation* [$r = -.366$] between the amount of content planning and text quality.) This suggests that writers who focus largely on planning specific content before they begin to write may be missing and/or ignoring important rhetorical goals and constraints, such as adapting a text for the audience.

We want to be cautious about drawing inferences about creativity from differences these studies have shown us between expert and novice writers. However, we have tried to isolate certain features of the writing process that lay a foundation for original and useful solutions to rhetorical problems.

Because creativity is a uniquely adaptive response to such a problem, it seems important that some writers base their effort on first exploring multiple dimensions of the rhetorical problem they face. In response to that situation, they appear to develop a unifying theory of the task which integrates their knowledge with their goals. Insightful adaptive effort is an important part of creativity, but it

does not, of course, necessarily involve originality. However, these writers also showed us one of the foundations of such inventiveness. Instead of relying on their prior knowledge and resorting to direct knowledge-telling or relying on standard schemas or conventions, writers who develop a dynamic and rhetorical representation of their task plunged into extended constructive planning. They not only generated fresh inferences, new goals and adaptive plans, they created a unique configuration of such information adapted to the entire problem as they perceived it. Although the process will not insure the product and we must not discount other factors, including domain knowledge, this integrative rhetorical planning we observed in some writers offers a strong cognitive basis for rhetorical creativity.

SECTION IV: DEVELOPING AND APPLYING PROBLEM-SOLVING STRATEGIES FOR REVISION

Writers who come up with innovative solutions to ill-defined tasks rarely do so without making substantial revisions to their text; in fact, the kind of practical creativity we are discussing in this chapter often requires a writer to spend considerable time and effort on improving, and sometimes re-thinking, a text before arriving at a final version. For experienced writers, "revising" may involve "re-seeing" the text on a global level and making major changes to the meaning and to the overall structure (Sommers, 1980; Faigley & Witte, 1981). Our research on the cognitive processes of revision (Hayes et al., 1987) indicates that making these kinds of substantial text-changes involves complex problem-solving activities which depend on strategies for pruning down the many options for the text into a productive set of alternatives, and for choosing between these alternatives. In this section, we look in more depth at the kinds of strategies writers develop for revising an expository text.

Text problems which are global in *scope* (i.e., they encompass the whole text, or a substantial proportion of it), or which relate to broader and less clear-cut (i.e., global) *issues*, such as audience and purpose, invariably have no easy answers. Both these types of global problems require more than the "quick fix" procedures needed for correcting routine mechanical or grammatical errors; rather, they are difficult for writers to solve because they are themselves ill-defined in that there are many different goals and sub-goals that a writer might develop to guide her revision and many possible solutions to the problem. The process of solving global revision problems widens a writer's options and thus increases her potential for producing an effective and innovative final version of a text.

In our study of revision (Hayes et al., 1987), we found that one important revision process in the repertoire of our expert writers (and a stumbling block for many of our novices) was the ability to successfully *diagnose* global text problems. We characterize "diagnosis" as building a representation of a text problem which provides a writer with some specific information about the type or category of problem and some possible strategies for improving the text (Flower, Carey, & Hayes, 1985). Sometimes when evaluating a text (either her own or one written by another writer), a writer will sense that "something does not sound right"--that is, she *detects* a potential trouble spot. If the writer goes on to expand upon this intuition and explain why the text is poor by coming up with a name or category for the problem, then she is making a fully-fledged diagnosis. A diagnosis differs from a detection, (e.g., "this is terrible"), in much the same way that a patient's heartfelt, but weakly specified complaint differs from a physician's more multi-dimensional, high-information diagnosis, involving a problem, symptoms and solutions. The power of diagnosis resides in identifying the situation as a

particular problem type which in turn activates a body of tests and solution procedures. Diagnosis thus *allows for* strategic revision.

Here we will look at some case-studies of writers diagnosing and solving ill-defined text problems. We draw on data from a study of expert and novice writers who were given the task of revising a poorly written, and rather pedestrian, memo from one athletics coach to another about women's sports opportunities on campus; our subjects were asked to produce a revision of the text which could be given to freshman women students as a one-page handout to introduce them to campus sports (see Hayes et al., 1987). Again this was a fairly typical professional writing task in that, as well as solving language and organization problems, our writers needed to change the overall focus of the text and adapt it for a new audience who might not be very motivated to read it. We will examine in some depth our writers' diagnoses related to a particularly problematic section of the text which was part of larger, whole-text coherence and audience problems, and which also contained several fairly local problems such as faulty topic focus, negative tone and structure, faulty parallelism and wordiness. This section of the original text read as follows:

> I don't want to infer that the only chance women get for participating in sports is on varsity teams. Intra-mural sports are not the same as varsity sports in which the rules are better, equipment is better, with the techniques of the players being more developed. Irregardless, IM sports may be the choice for many women--they can be just as much fun and take less time.

Our writers represented the problems with this excerpt of text in qualitatively different ways. First, the experts tended to build integrated networks of diagnoses to deal with global text problems. They noticed connections between independent problems at all levels of the text: they saw individual choices of diction, style and content in terms of a larger multi-sentence context; they saw concrete evidence of broad global problems in smaller problems. Conversely, the novices tended to see local disconnected problems which were not tied to the larger context; they either did not see the larger problems, or did not connect global problems to local ones.

Second, because many of the experts in our study built *elaborated* representations of text problems, they came up with a variety of solution procedures; the novices tended to build more simple representations which did not allow them to come up with very effective solutions. Because the experts were able to *locate* these different facets of complex problems in specific text features, they had a wider range of strategies to help them solve both individual local problems *and* larger global ones.

Case-Study 1: Building an Integrated Problem Representation

Although we found interesting individual differences within our subject groups, this case study is especially pertinent to understanding creativity because the two writers here typify differences in the amount of integration in our experts' and our novices' problem representations. Figure 1 shows all the diagnostic comments made by one of our teaching experts (BA) about this paragraph and Figure 2 shows all those made by a novice (ML).

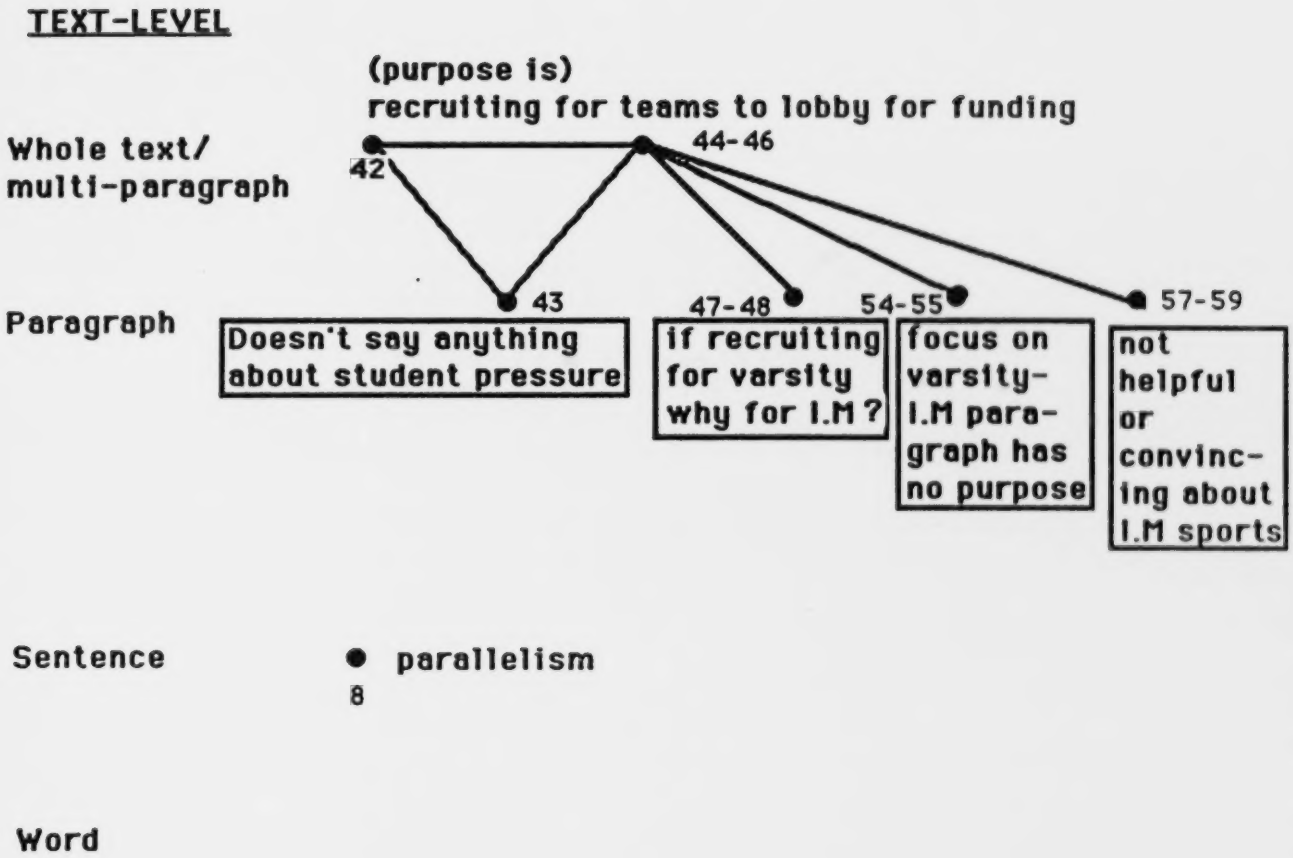

Figure 1. Expert's Diagnostic Comments

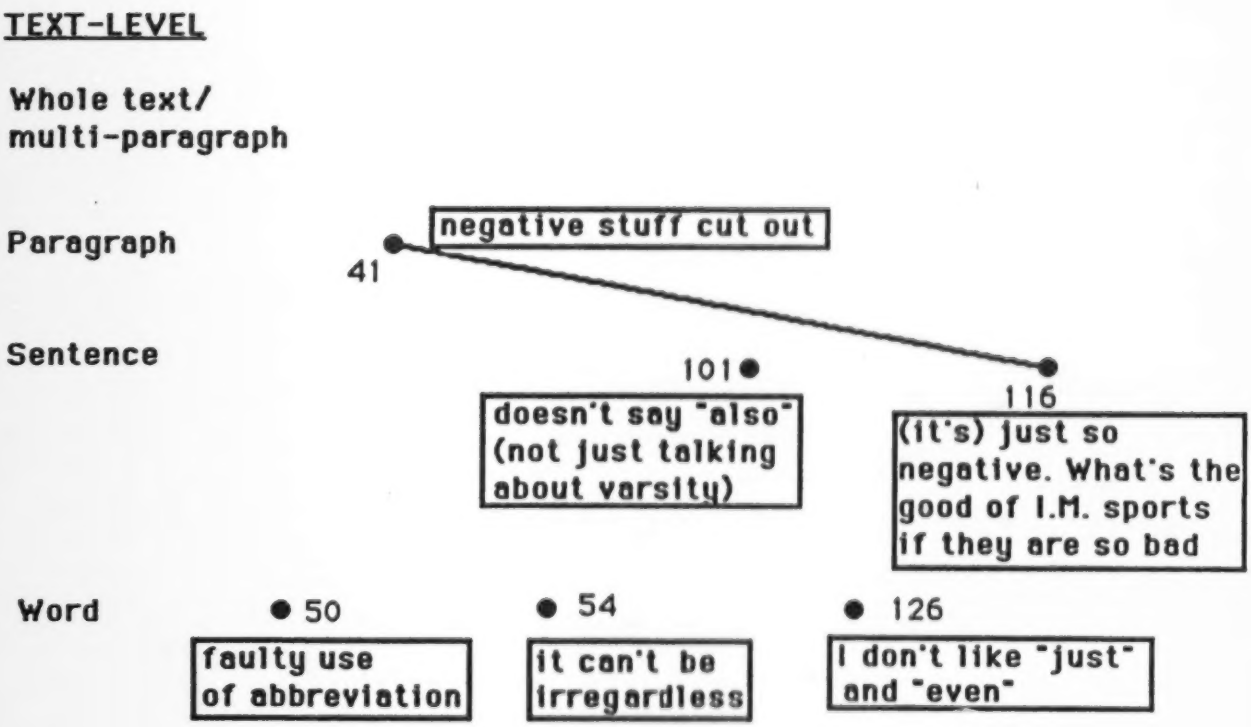

Figure 2. Novice's Diagnostic Comments

For each subject, we distinguished the text level to which the comment applied--i.e., whole-text/multi-paragraph, paragraph/inter-sentence, sentence, word level--and the general category of problem mentioned in the comment. We looked specifically at whether the revisers built integrated networks of diagnoses which related text problems and which spanned text levels. Where the subjects made explicit connections between diagnoses, either at the same text level or across text levels, the lines on the figures indicate these connections.

Let us take a closer look at our expert's diagnoses in Figure 1. In order to build a representation of the major problems with this excerpt, the expert (BA) relates her concept of the overall purpose of the memo (to recruit for teams in order to lobby for funding--P44-46) with paragraph level diagnoses which focus on: missing information (P43); illogicality in the argument structure (if the memo is recruiting for varsity teams, why talk about Intra-Mural teams--P47-48; and unhelpful and unconvincing information about I.M. sports which has no purpose--P54-55,57, 59. She successfully diagnoses some of the individual local problems within this paragraph; however, these diagnoses are closely related both to each other and to a larger whole-text problem. By creating this hierarchically structured and integrated representation, BA is able to work at several text levels simultaneously. She can thus "re-see" the text by working on local examples which contribute to the larger problem.

In contrast, novice subject, ML, (Figure 2) does not relate this paragraph to the text as a whole in her diagnoses. Rather than seeing one large problem, ML sees several small word-level problems (faulty use of an abbreviation--P50, and faulty word choice--P54, C126) which are not related either to each other or to the sentence level problems of incoherence (C101) or "negativeness" (C116) which she diagnoses. However, we do see this novice beginning to work more like the expert, though still on a paragraph rather than a whole text level; she attempts to integrate a rather fuzzy paragraph-level diagnosis that this paragraph contains "negative stuff" (P41) with her diagnosis that a particular sentence seems illogical ("what is the good of I.M. if they're so bad"--C116).

These two writers were fairly typical of the expert and novice writers in our study. In Figure 3, we represent schematically the diagnostic comments made by two other teaching experts and two other novices as they considered the problems in our sample excerpt of the original text. Figure 3 indicates the text levels of the problems that these writers saw, and the extent to which their problem representations were integrated. (The lines on the figure represent explicit connections between the writers' diagnoses and/or detections of text problems.)

The problem representations of the experts and novices (see Figure 3) were very different: first, the experts' diagnoses were integrated whereas the novices' were more fragmented and independent of each other; second, the experts diagnosed problems at several levels of the text, particularly above the sentence level, whereas the novices focused almost exclusively on sentence and word-level problems; and finally, the experts diagnosed global problems (such as audience and purpose) whereas the novices often could *detect* that something global might be wrong with the text--e.g. one subject commented that "this whole paragraph sounds ridiculous"--but were unable to come up with a fully-fledged diagnosis. Our analysis suggests that experts' ability to integrate diagnoses of local problems with each other and with whole-text diagnoses allows them to see local problems in the context of more global ones. This interaction of the local and the global provides experts with a rich conceptual framework upon which to base their solution procedures.

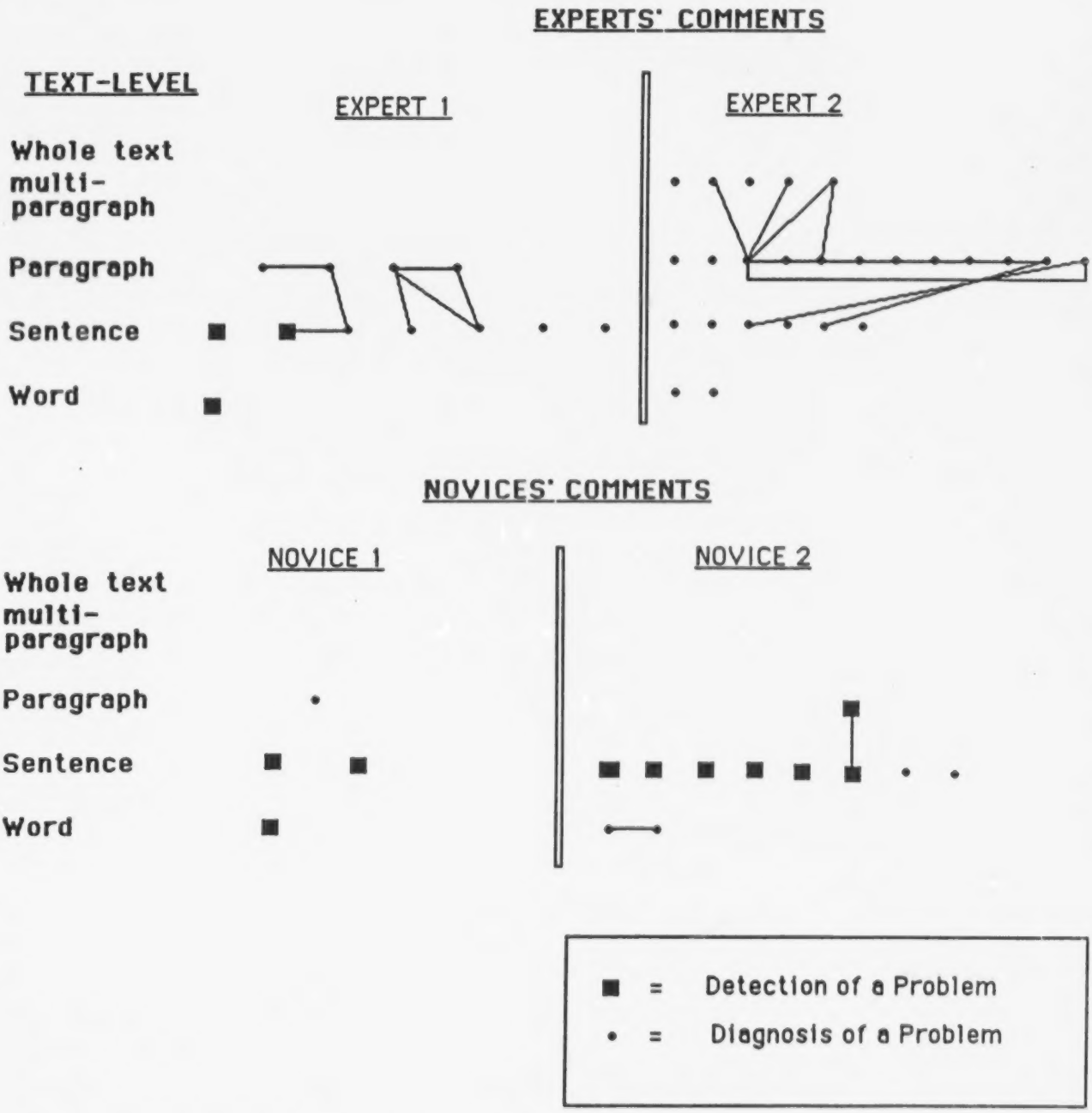

Figure 3. Networks of Experts' and Novices' Diagnostic Comments

Novices, on the other hand, appear to be driven mainly by the text itself, an approach which does not allow them to import a representation of the unstated purpose of the whole text. Because they often *only* see the isolated local problems, their solutions are more likely to be *ad hoc* and less goal-driven than the experts'.

Case-Study 2: Using Diagnosis to Develop Solution Strategies

In this second case-study, we look at how one of the experts and one of the novices used their diagnoses of text problems to develop procedures for improving the text. First, we examine some episodes taken from the protocol (P) and cued recall (C) of an expert writing teacher who effectively diagnosed and solved the problems in our example excerpt. (The underlined statements in these episodes indicate where the writer was reading from the original text.) We have selected some key episodes which illustrate how the subject dealt with one of the major problems in the "I don't want to infer" paragraph, a problem which he categorized as "negativeness". Notice how he starts by working with a whole paragraph as a single movable unit.

Protocol

P73 What I guess I'd do now is to move this paragraph, or the contents of it
P74 the one about personal benefits, up here.
P75 Continue with the positive things about it rather than the negative.

C163 If you look at these two sentences of which I guess I actually cut everything but about three words.
C164 They are both split in the negative.
C165 I don't want (to infer)
C166 Intramural sports are not--which I think is not the way a recruiting document should be.
C167 I think you should put in a positive statement.
C168 And secondly, both of them are really lead-ins that don't get you anywhere.
C174 But since we use in addition to varsity sports . . . intra-mural sports attract these acts and so on
C175 where you tell what it is rather than what it is not.
C176 which is just a delaying tactic.

C188 The paragraph is claiming from the very beginning that she is going to talk about intramural sports,
C189 yet as I said, the first two sentences introduce intra-mural sports with a negative
C190 and then there's all this information about varsity sports.
C191 So what I tried to do was to substitute information about intra-mural sports.

C228 . . . either the words or the structure itself, connotation of the words or the structure itself is negative.
C229 It's negative, negative, negative.
C230 I don't have a logical mind.
C231 I can't follow negatives.
C232 I go make them over.

C233 And if I say that I do not want you to think that I don't care about your reluctance, I've lost myself,
C234 because I'm talking about a double negative about a negative mental attitude,
C235 and I can't follow it.
C236 I don't think most people can.
C237 I just changed the structure.
C240 I'm simplifying the sentence structure and making it more direct.

C261 That negative approach thing (feel that participating in sports is another pressure they don't need.)
C262 They don't need it.
C263 But it's also that I just changed the whole sentence structure.
C264 The sentence structure as the writer had it is that many new students feel that participating in sports is another pressure they don't need.
C266 I set up the structure differently.

C441 Then it seemed to me to emphasize the benefits first as opposed to the reluctance or the problems students feel,
C442 so I brought the--so I changed the order from--
C443 the way this writer had it was the negative to the positive.
C444 I brought the positive to the benefits, to the negative, C445 which I close with another positive statement to de-emphasize the negatives or the complaints of the problems people feel.

This expert built an elaborated problem representation which provided him with a rich knowledge base for solving the problems in the text. His multi-facet diagnosis sees the "negativeness" problem not only in the words, but also in the syntax, in the ordering of information, and in the rhetorical effect of the text. For example, he diagnoses that the connotations of the words and the grammatical structure are both negative (C228); that the "lead-ins" which lead nowhere (C168) highlight inappropriate and negative information; and that the sentences shift the focus to the worst aspects of sports and delay the presentation the key ideas (C174-176). In addition, he sees these individual problems as symptoms of a larger, more global problem: a negative approach is inappropriate for the overall rhetorical purpose (as he represents it to himself) of the handout, i.e. for a recruiting document (C166), and he recognizes recurring patterns of negative structure and tone throughout the whole text (P73-75). In fact, he generalizes about the rhetorical effect of "negativeness" on readers--i.e., that "double negatives about a negative mental attitude" are too difficult for most readers to follow (C234-236).

This writer was able to be very specific in his diagnoses of this complex problem. He effectively locates problems in actual text features at several levels--multi-paragraph (P73-78), paragraph (C188-191), and sentence level (C261). This rather difficult "mapping" of general and abstract problems on to the text appears to be an important step in moving from diagnosis to action. This writer's diagnoses enables him to come up with a range of concrete and useful strategies for improving the text which are closely tied to text features. Thus he decides to:

- move the paragraph to continue with the positive statements (P73-75): multi-paragraph level
- put in a positive statement (C167): paragraph level

- substitute information (in the paragraph) about intra-mural sports (C191): paragraph level
- change the order of the statements from negative/positive to positive/negative/positive (C441-445): paragraph level
- simplify the sentence structure to make it more direct (C240): sentence level

The elaboration and locating of problems in the text, which we noted in the expert's diagnoses, provide a contrast to the performance of one of the better and most fluent of the novices. The comments, below, represent this subject's diagnosis of this same problem paragraph.

Protocol

P41 I don't want . . . This is all negative stuff.
in which the rules are better, the equipment is better)
P42 It can all be cut.
P45 They (are) a little more casual I guess.
P47 Um this I.M. down here, I'll go back to that too.
P48 I'll make basic corrections
P49 and then go back and improve.
P50 This I.M. There's no I.M. before
P51 so you have to go back
P52 so this should be Intra-mural again.
P54 Irregardless . . . it can't be irregardless.
P55 I guess I've got to change that.
P56 So we'll cut that out
P57 and it should be "I.M. sports . . .
P58 They can be just as much fun as varsity sports and take less time."

.

P128 I don't want to infer . . . keep varsity,
P129 intramural sports are . . . tend to be a bit more casual
and less demanding.
P129a I.M. sports may be . . . perhaps a more influential . .
P130 Participating is an extra, um let me see..
P132 is an addition.
P133 Oh well, I'll go back to that.

.

P179 I don't want to infer that the only chance women get for participating in sports is on varsity teams. There is also
. . . there are also I.M. sports
P180 which are not quite the same as varsity.
P181 They tend to be a bit more casual.

.

C114 (Experimenter: you crossed out the whole . .)
C115 Well it's just so negative.
C116 It's like, so what's the good of I.M. sports
C117 if there so bad.
C118 They're just a bit more casual, not as disciplined.

.

C125 (Experimenter: and just?")
C126 I don't like "just" either.
C127 "Even", "just" and "like", I don't like.
(Had commented earlier: "I was always told in any composition class I had that "like" is just bad to use. So I always put "such as.")

Where the expert's comments show an elaborated representation of the text problems, the novice's comments are sparse and undeveloped. The expert saw an interplay of lexical, syntactic, semantic, genre-related and rhetorical problems; the novice sees only one--"negative stuff" (P41). Her diagnosis is based on a simulation of a reader's response (C116-C118), a form of diagnosis which normally provides only a very generalized, and open-ended definition of the problem. This subject's response is also typical of novice diagnoses in that it depends primarily on the reviser's common sense social or topic knowledge, rather than on rhetorical knowledge; she imagines what someone might say about I.M. sports, and rewrites the content of the text to fit her own ideas (P45, C118)

Broad, intentional diagnoses, of the sort both expert and novice were making, pose a built-in problem for the reviser who must map something like a general sense of "negativeness" or a lack of focus on to specific features in the text. Generally speaking, the more global the diagnosis, the harder it is to exactly locate the problem in the text and the fewer strategies are available for acting on the diagnosis. Here, while the expert has several procedures operating on different text levels, the novice has few. In fact, she demonstrates a typical novice strategy: first she localizes the problem in a single offending clause (P41); then she solves the problem by deleting (P42), and by substituting her own new information (P45). She returns to this section of the text on two later passes and simply rewrites the sentence to fit her own ideas about Intramural sports (P128-133; P178-180). In addition, on some occasions where she is unable to map a general diagnosis to the text (P133), she finally decides to leave the problem alone. We suspect that novice revisers simply may not know how to locate the source of their own responses as readers in the text features that prompted those responses

These two case-studies illustrate the key role of diagnosis in developing effective representations and solutions to ill-defined revision problems. The problem representations our experienced writers built were not just bigger, but qualitatively different from the novices'. The experts were a) seeing individual problems as part of a conceptual whole, and b) developing a wider range of effective strategies based on several dimensions of the problem. Overall, we found that our expert writers had several general strategies for dealing with ill-defined revision problems:

1. In the act of building a representation of an ill-defined problem, expert writers are seeing an integrated set of more familiar sub-problems. When a global, ill-defined problem is located in features of the text, the diagnosis becomes more operational because it now says something about where and how to proceed. It is the difference between being told to "be more clear" and being told to "define your key terms earlier in the paragraph." Finally, once these abstract problems are given a local context and a name in the form of sub-goals and text features, they can lead to text changes, which, though the changes themselves are local, are controlled by a larger, integrated problem and plan.

2. As these writers build their problem representation, they create *sub-goals* which function as tests for success. The novices' criteria tended to be vague--"well it's just so negative," while the experts' were much more specific--"the connotations of the words and the structure itself is negative."

3. Creating tests and sub-goals could have the result that a writer only deals with the isolated local problems and loses sight of the larger context. For example, meeting the goal to introduce some new technical terminology could interact with a more global goal to maintain a chatty, informal tone. Experts try to maintain this part/whole balance in part by invoking global tests. For instance, towards the end of the protocol of one of our expert writers, after he has made a number of local revisions, the writer decides to "read (his text) over and see what it sounds like" to test for a potential whole text problem: "I have a feeling there is still a shift in tone. The first paragraph is more formal and it gets less formal as it goes along." Thus the problem-solver is able to shift back and forth from representing local problems to seeing their global effects.

4. Finally a very important expert strategy was a *planning* strategy. Often when experts are diagnosing and developing solutions to ill-defined problems they work on a more abstract level with goals and gists rather than with actual text. This allows revisers to integrate various top-level goals before getting into specifics and it provides an overall framework for their diagnoses and text changes. Local problems can then be confronted only after a tentative global plan is formulated. Because goals and gists are an effective way to chunk lots of information, revisers can come up with several alternative plans for improving the text. On the other hand, a plan that looked promising in the abstract may not work out at a local level, and the reviser may be pushed back into re-representing the problem. For dealing with complex revision problems where there is not one easy answer, this strategy of planning with goals and gists gives writers more flexibility than working with prose, and allows them to turn vague, amorphous problems into more manageable ones.

In this paper, we have tried to use recent research in cognition and the composing process to describe some features of this process that help lay a foundation for creativity. Creativity, whether it is practical creativity or genius class work, clearly rests on many capabilities, including rich knowledge, social expectations, and the context for performance, in addition to cognitive actions. However, our analysis would lead us to contribute two observations to this picture of creativity.

One is that the writing process itself shows us some powerful mechanisms for creativity in the act of building a representation of a problem; in the process of exploring multiple dimensions of that problem and integrating that knowledge into a unifying theory of the task and an integrated plan; and finally in the act of using revision as an opportunity to re-envision a text and to deal with individual elements of a text as part of a meaningful, purposeful whole. These powerful, but demanding processes in writing are a potential source of both adaptive and original solutions to rich rhetorical problems.

Our second observation is that these features--this potential inherent in the cognitive process of experienced writers--is no guarantee of creativity. On the other hand, as educators, it strikes us that many of our students are shutting down this potential in themselves. The strategies which lead them to depend on knowledge-telling, to take limited and tentative looks at their rhetorical problem, to build simplistic images of their task, to invoke rigid rules in the face of a complex situation, and to use revision as a limited tool for repairing local problems--all these approaches to writing produce a process that does not rise to inventive and generative problem-solving when it is needs to. Although we can not guarantee creativity, we can, we believe, help writers develop the strategic, cognitive tools they need to meet situations which demand it.

The focus of this paper has been on practical creativity--on the variety of creative responses that all sorts of writers bring to many kinds of writing problems, in school and in professional work. It follows that one important line of research growing out of the work we have discussed will pursue the illusive trail of creativity in real world situations, particularly those situations where a creative (i.e., a valuable) response to a rhetorical situation is called for, or is likely to make a difference.

Education and writing in school is one place where creativity makes a difference. Our survey suggests some of the following research areas and questions:

Ill-Defined Tasks: What is the difference between the expert and novice strategies used in various kinds of writing and the power of those strategies to foster creativity? How do writers with different levels of expertise handle the problem and the potential of ill-defined tasks?

Task Representation: To what extent are students' performances on standard school tasks which involve writing conditioned by the ways they represent their task to themselves? Are students sometimes constructing representations that diminish a task, or even that obliterate the opportunity for creativity?

What is the role of instruction in fostering a creative approach to ill-defined tasks? For example, how do teachers communicate their expectations of creativity? How can they make the process of thinking creatively operational--an act student writers can work toward? Does instruction sometimes present a romantic view of creative work which fails to recognize the role that energetic and enterprising cognition *can* play?

Planning and Revision: If we turn our attention to teaching, one important question we would like to answer is: does the more limited problem-solving we see in students' writing process, and in particular in their approach to planning and revision, simply reflect what these writers *don't* do, or what they *can't* do? A line of research that we think will be particularly fruitful will be work that focuses directly on the strategies writers use for open-ended tasks and on their own awareness of or metacognition about their options and process.

Currently, we are investigating whether students may have untapped, hidden planning skills which they could draw on, *if* they could be prompted or sensitized to do so. For example, if student writers are explicitly asked to plan on a more expert level (e.g., to focus on rhetorical planning, to elaborate goals or to deal with conflicts), would we find sharp gains in the sophistication of their planning?

Or would we see that applying these strategies, especially in the context of ill-defined tasks, requires better, more direct instruction? The results of this research will, we hope, provide a basis for helping student writers to develop their potential in the classroom. By building on students' hidden strengths as well as focusing on specific areas of difficulty, we can develop students' awareness of powerful cognitive strategies, and provide a springboard for a more creative approach to the writing process.

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